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THE STATUS OF FOREST REGENERATION IN REGIONS 1 and 4 OF THE U. S. FOREST SERVICE

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THE STATUS OF FOREST REGENERATION IN REGIONS 1 AND 4 OF THE U. S. FOREST SERVICE

GENERAL

This statement is an examination of the status of forest regeneration in Regions 1 and 4 of the U. S. Forest Service. "Forest regeneration" is understood to mean young trees (up to 4.5 feet in height) which originate by either natural means or by seeding or planting by man. Forest regeneration is the initial stage of a long-time crop which is destined to have a profound biological effect on the site where it grows and an equally far-reaching economic and sociological effect during and at the end of its lifetime.

Forest regeneration is or should be an intimate and inseparable part of forest menagement. The mere cutting and removal of mature and overmature trees from the forest and the systematic disposal of slash is only crude and inexcusable forestry. It means, in effect, that the forest is being mined and not managed, a professional sin. It becomes necessary, therefore, to incorporate plans for regenerating the forest based on silvical facts for a particular species or type with the silvicultural policy of management. Unless this policy is formulated, employed, and periodically checked, forest management will be indefensible.

During the course of the summer the writer visited thirteen national forests in Idaho, Montana, and Utah including the Boise,

Payette, Nezperce, St. Joe, Kootenai, Kaniksu, Bitterroot, Lolo, Lewis and Clark, Gallatin, Dixie, and Fishlake. Most of the visits were made in the company of research associates who were familiar with the forest management problems of the areas included in their respective research centers. Some forest supervisors, timber staff men, rangers, and assistant rangers were also interviewed and others explained problems in the field. In this way a fine opportunity was afforded to inspect regeneration problems where they exist. Obviously, time did not permit reaching as many localities as desired by the more important ones were included.

The appearance of this statement is propitious because it comes at a time when more attention is being given to intensive forest management than heretofore, particularly in Region 4. Inventories of forest resources are rapidly becoming available, annual cutting budgets are being increased, artificial regeneration is being encouraged and planned, manuals of timber stand improvement are being composed and forest enemy survey and control programs are in an uptrend. The intensiveness of silviculture is becoming pronounced. All these measures are aimed at orderly procedures for increasing forest production. It is logical, therefore, that the status of regeneration in forest management be closely examined, carefully appraised, and that problems be critically reviewed so that research problems can be isolated and considered in order of their priority for solution.

OBSERVATIONS AND IMPRESSIONS

Northern ~~Rocky Mountain~~ Region

The Inland Empire

Roughly the Inland Empire comprises some 5,000,000 acres of forest land in extreme northeast Washington and Idaho north of the Salmon River. Of the 3,600,000 acres of white pine type, one million acres have been determined as economically feasible to manage.[1]

White Pine Type.--At the present time and in the discernible future, white pine is more valuable than its associated species which include Douglas-fir, western larch, western hemlock, western redcedar, grand fir, lodgepole pine, Engelmann spruce, and alpine fir. Regardless of whether this view is tenable or not, the management of this species has been established as workable and there remains only the uncertainty of pole blight[2] and losses from it. Fortunately, white pine can be reproduced by either natural or artificial means depending on what reproduction method is considered most suitable for a particular site. Some difficulty is experienced on southern exposures where prompt invasion by weed vegetation occurs and

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1/ Matthews, Donald N. and Hutchison, S. Blair. 1948. Development of a blister rust control policy for the national forests of the Inland Empire. U. S. Forest Service, Northern Rocky Mountain Forest and Range Experiment Station, Station Paper No. 16, 116 pp. [Processed].

2/ Pole Blight Investigations Steering Committee. 1952. Pole blight--what is known about it. Northern Rocky Mountain Forest and Range Experiment Station. Misc. Pub. No. 4. 17 pp.

which provides severe competition. Douglas-fir, western larch, hemlock, and western redcedar, the most common associates of white pine, establish themselves readily on most sites particularly where the mature stand is not clear cut and broadcast burned.

It is obvious in all newly established white pine stands, regardless of the method used to reproduce them, that early weedings are a necessary part of management. The initial establishment of white pine of acceptable stocking per acre does not guarantee that this stocking will be indefinitely sustained and in many cases a weeding is paramount to survival.

Ponderosa Pine Type.--Large areas of second growth of this type comprise about a million acres at the lower elevations in northeast Washington and northern Idaho. Within the white pine type, ponderosa pine occurs on the drier, thin-soiled ridges and the southwestern exposures where soil moisture favors the species over its competitors with the result that no extensive areas of the type occur. The vast areas burned over between 1900 and 1930 now support some impressive examples of successful seedings and plantations of this species. There are exceptions, to be sure, but the occasional case of plantations which exhibit poor development and even mortality at an age where rapid growth should be evident, can probably be traced to unsuitable site, exotic seed source, or disease. Large areas still remain to be planted on the uncontrolled burns of the past and the competition provided by brush will have to be largely eliminated to

insure survival. This problem has been met by the skilfull use of herbicides developed in connection with the elimination of Ribes and later extended to sources of competition such as Ceanothus, Prunus, Salix, and the grasses.

Several interesting and unusual cases of plantation condition were examined. At Kalispell Bay a plantation of trees about 15 feet high is obviously in poor health. Many stems are dead, nearly all trees have a low needle complement and living trees are making poor growth. Armillaria melea, nonindigenous seed source, lowering of soil temperature, and unsuitable site have all been advanced as reasons for this plantation's condition. Two plantations north of Savenac Nursery headquarters site established on part of the 1910 burn were visited, one was a 1911 seeding whith a corn planter with seed from the Lolo and Black Hills National Forests; the other was a 1912 planting of unknown seed source. Both these stands, particularly the seeding, where unfortunately the seed sources were not kept separate, exhibited slow and irregular growth about 1935 and then marked recovery which was sufficiently pronounced as to be noticeable. There were also gaps in the stocking. It prompts one to wonder, whether certain plantations which are occasionally "written off" due to their condition as, for example, the one near Saltese, west of Savenac, are not merely passing through a period of severe adjustment and will eventually recover as this one did and apparently the two north of Savenac.

The survival of artificial and natural regeneration in the ponderosa pine type in the Inland Empire on sites of that species as judged by observation and experience suggests that no insurmountable problems exist. The reasons for this encouraging situation are less apparent and without a more accurate appraisal one can only surmise that soil moisture retention and seasonal rainfall are such as to produce acceptable survival. (See Table 1). It is enlightening to observe that the growing season precipitation in the three central Idaho locations are less than any of the other places. Even at Spokane where seasonal precipitation is approximately the same as Lowman and Council, the July and August rainfall is 20 percent higher. It is also noteworthy that Hamilton, Montana, which is in the Bitterroot valley and therefore probably experiences less rain than in the adjacent mountains where there are extensive stands of ponderosa pine, has a rainfall during the critical summer period of 4.17 inches, 25 percent higher than the highest figure for central Idaho and 70 percent higher than at Idaho City which is considered some of the better producing ponderosa pine country. This fact becomes even more striking when it is seen that the total annual rainfall is only 50 percent of the total for Idaho City. The same relationship is true, to a slightly lesser extent of Idaho City and Spokane. These excesses of seasonal precipitation may partly explain the higher survival of artificial and natural regeneration in the North.

Comparisons of a limited number of soil analyses in the Kootenai and Bitterroot National Forests and Boise Basin indicate that while percentage of sand aggregates are slightly lower in the north, proportions of silt representation is consistently lower in the Boise Basin and clay consistently higher. This would suggest greater availability of moisture for plant growth in Montana. The lower rainfall in central Idaho and the high percentage of clay in the soils would also produce an effect adverse to tree growth, according to Pearson[3/].

Table 1. Average seasonal and annual precipitation for selected locations in Washington, Idaho, and Montana

	June	July	August	September	Total seasonal	Total annual
			Inches of rainfall			
Spokane, Wash.	1.28	.69	.62	.90	3.49	16.62
Coeur d'Alene, Idaho	1.56	.60	.65	1.38	4.19	24.35
Idaho City, Idaho	1.00	.44	.41	.66	2.51	21.48
Lowman, Idaho	1.40	.54	.54	1.00	3.48	22.95
Council, Idaho	1.60	.50	.42	.93	3.45	25.78
W. Glacier, Mont.	2.52	1.15	1.23	2.03	6.93	25.72
Libby, Mont.	1.54	.89	.83	1.31	4.57	18.57
Hamilton, Mont.	1.75	.76	.66	1.00	4.17	11.17

Grand Fir.--Very little work has been done in this species which is found in substantial volumes per acre in the Inland Empire but particularly on the Clearwater, St. Joe, and Nezperce National Forests. The tolerance and seed producing tendencies of the species, however,

3/ Pearson, G. A. 1931. Forest types in the Southwest as determined by climate and soil. U. S. Dept. Agr. Tech. Bul. 247, 144 pp.

indicate that regeneration is not a problem and several alternatives suggest themselves as a means of reproducing the type in which this species occurs in dominant numbers and volume. While considered a low-value species heretofore, its growth characteristics and reproductive possibilities rate it an impressive future source of wood fibre material for which a market already exists.

Montana

The commercial forest area of Montana embraces some 16,000,000 acres[4/] of western larch, Douglas-fir, lodgepole pine, ponderosa pine, Engelmann spruce, and alpine fir. More than half of this area is west of the Continental Divide in western Montana. It is obvious that unlike the Intermountain Region, the grazing of domestic stock is not a problem of consequence as far as forest reproduction is concerned.

Larch--Douglas-fir Type.--This type although found in the Inland Empire reaches its optimum development in western Montana where it occupies north and east slopes over extensive areas. The larch component is the more valuable segment of the stand and because of its intolerance can be established and later maintained in managed stands only by carefully planned silvicultural measures. The uncontrolled fires of the past are believed by reliable observers to be responsible for many of the larch (and ponderosa) stands which exist today. It

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4/ Timber Resource Review, Chapter IX. 1955.

is a species which is finding an increasing market and one which should be considered in forest management objectives in this area. It is silviculturally adaptable and responsive to treatment, manifested in its east of establishment, growth, and tendency to prune naturally.

Experimental results have shown that ample larch reproduction can be secured by the clear cutting, seed tree and shelterwood methods of reproduction, and that therefore artificial methods of regenerating areas are unnecessary. Clear cuttings can be up to 60 acres in area, roughly circular or in strips and should be broadcast burned. Mature and overmature trees left in shelterwood cuttings do not respond appreciably after release and should therefore be considered a seed source only. Some form of clear cutting appears most feasible when costs of slash disposal and riddance of the understory are considered, probably in about 40-acre blocks or perhaps strips depending on local considerations.

The subsequent (at 5 to 10 years of age) composition of the young stands established by the different methods will reveal whether or not they should be weeded and, if they should, what techniques should be used and what the costs will be.

Lodgepole Pine Type.--The most suitable method for reproducing lodgepole pine has been developed and demonstrated impressively by research in Adams and Jumping Horse Creeks on the Lewis and Clark National Forest near White Sulphur Springs in eastern Montana. Interestingly enough this developed from a request by Administration and it has been shown here that both natural and artificial regeneration are relatively easy to establish. Anomalously, clear cutting of

mature stands of lodgepole pine followed by scarification with dozer piling and burning which is believed to be the best means of treatment, often results in excessive numbers of stems per acre. One of the important problems to be solved and in which a start has already been made, is a practical way of regulating this initial density. Varying the time from the end of cutting to the start of slash piling and burning suggests itself as being a probable solution.

There is a sound reason for this initial regulation of density. It is pretty well agreed by those familiar with the species that early stagnation should be avoided at all costs. The logical place to start is at the time of establishment in order to avoid later expense by thinning unmerchantable stems. It is not too extravagant to say this may be the key to lodgepole management now that a means of reproducing the species has been found. Furthermore, by virtue of the knowledge now available, the rate of growth of the species, the large areas supporting it, the strides in utilization of the wood, and the current interest by industry, lodgepole pine may very well emerge as one of the most important conifers of the West.

The treatment of regeneration after it is established requires additional research. Few will dispute that the demand for lodgepole pine will continue to increase and knowledge of its management will be greatly needed, in fact, it is needed now. This takes the form of determining the optimum stocking of stems from the time the stand is about 5 years until maturity.

It is probable that research results obtained in Montana will be applicable to lodgepole pine in Region 4.

Ponderosa Pine Type.--There are substantial volumes of ponderosa pine in western and eastern Montana. Recent work on this species has been at Lick Creek at the south end of the Bitterroot valley and on Wapiti Mountain and Richards Creek on the Kootenai National Forest. Ponderosa pine is found at the lower elevations and on the south and west slopes at the higher elevations.

There appears to be more advance growth in the pine stands than in central Idaho. This may be explained by reasons considered valid for the same phenomenon in the Inland Empire (see pages 6 and 7) i.e. that growing season precipitation is consistently higher and soils are less desiccative. There also appears to be fewer competing shrubs. There has been little or no research work in artificial regeneration because it is felt that natural regeneration is not usually difficult to secure providing that suitable measures are taken and a reasonable length of time (7 to 15 years) allowed for natural seeding. It is also believed that work done in central Idaho will complement the work at Lick Creek with results of work in Idaho being applicable to Montana.

On many parts of the Kootenai National Forest a serious problem is manifest in the damage to ponderosa pine reproduction by the white-tailed deer. In some areas the pine seedlings are all killed by browsing of these animals in striking contrast to those within fenced

exclosures which are normal and making fair growth. This quirk of nature's balance obviously has not always been in effect. It is conjectural how long the situation might take to right itself but certainly a real problem exists when a private lumber company lays plans to fence their land at exhorbitant cost. The obvious solution is to reduce the deer herd, by whatever means proves appropriate, after a statement by the Economics Division has clarified and promulgated the conflict that exists in crop values and pointing out the wisdom of correcting an important situation even though drastic steps might be necessary to effect it.

Spruce-fir Type.--There is some 7.0 billion board feet of Engelmann spruce in Montana,[4/] and cutting in this important type is producing increasing volumes, thus requiring immediate need for management guides. An excellent start has been made in this interesting type which flanks the Continental Divide.

Cooperative cuttings with Administration and experience in Colorado has shown that, like most tree species, mineral soil produces the best results. This is simply because mineral soil is the only available medium which retains moisture. There must also be a seed source and preferably some precaution against site drying, although the latter is difficult to achieve. This combination of requirements has been produced in Montana by two methods of site preparation after clear cutting, dozer piling and burning, and broadcast burning where

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4/ Timber Resource Review, Chapter IX. 1955.

sites are too step for machines. Broadcast burning requires skill and courage for the necessary results and has the advantage of eliminating the alpine fir advance growth which is usually well represented in the virgin stands due to its greater tolerance. Also, a certain amount of shade is produced by the unburned heavy fuel. This site treatment has the disadvantage of raising surface soil temperatures besides the difficulty of securing a sufficiently hot burn to eliminate plant competition. Dozer piling and burning on the other hand, has the advantage of permitting larger areas to be cut because surviving windfirm understory trees provide a welcome seed source. Further work should be done to test these two systems to compare their respective merits.

If seed is available, particularly where the aspect is northerly or easterly and where the site is inclined to retain soil moisture, excellent results have been obtained by dozer piling and burning. In some cases where high surface soil temperatures are generated and the top soil layers becomes dried, heavy mortality ensued the first year. This is because spruce seedlings do not send down tap roots as quickly as their associated species. This is an important fact because the composition of the stand can very well be decided in the first year after a cutting and indicate whether or not a subsequent weeding will be needed.

One of the most remarkable ecological stages wrought in the spruce-fir type after clear cutting and which has a direct bearing on the regeneration, is the invasion of the lesser vegetation including shrubs, forbs, and grasses but particularly thimbleberry and

fireweed. Precisely how long the mineral soil remains receptive as a seedbed depending on treatments and on different sites is unknown and will have to be settled. It may very well transpire that on some sites, or on sites which fail to regenerate naturally after 3 years, planting will have to be employed.

Artificial regeneration, both seeding and planting, has been tested to a limited extent. Artificial seeding from the few trials made does not appear as promising as planting. A planted area on a large burn showed examples of good and poor survival suggesting that healthy stock properly handled can show acceptable results.

Douglas-fir Type.--There is more Douglas-fir in Montana (15 billion feet board measure) and in Region 1 than any other species[4]. No experimental work has been done in this type but results of research in the larch--Douglas-fir and spruce types indicate that the methods used would also apply to the Douglas-fir type.

Intermountain Region

Revised estimates[5] indicate a substantial volume of 35,851 million f.b.m. in the region on national forest land, a 263 percent increase over the previous figure. Some 75 percent of this total is in Idaho. Of the nearly 28 billion f.b.m. in Idaho approximately half (12.8) is on the Boise National Forest. The same forest supports more than 60 percent of the ponderosa pine on the national forests in

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4/ Timber Resource Review. Chapter IX. 1955.

5/ Revised Timber and Area Estimates, 1953. National Forests Region 4.

southern Idaho and more than twice that on the Payette National Forest. It is logical, therefore, that the major effort in forest research should be located in southern Idaho and probably on the Boise National Forest.

One of the most frustrating aspects of forest management problems in this region is the conflict between grazing and silvicultural practice. There are few, if any forest areas, that are immune from the presence of stock. When stock descend on and move over an area being reproduced, either artificially or naturally, the damage is real, heavy, and costly and in some instances, complete.

There is probably a regional minimum of 10,000 acres a year created in the process of timber sales that require either natural or artificial regeneration.

There has been little planned scarification after harvest cuttings even though it is known that mineral soil is a first axiomatic step in securing natural regeneration. One reason for this is probably because most of the cutting, at least in recent years, has been of a salvage nature (at least in ponderosa pine) and created openings have been incidental. It is evident, too, that policy in cutting methods is variable and flexible on the different forests not only in reproduction methods but also in timber stand improvement of established reproduction.

Ponderosa Pine Type.--While exceeded in volume by Douglas-fir the pine type has been and will probably remain in the discernible future

by far the most important tree species in Idaho south of the Salmon River. It is here, too, that problems in regeneration, both natural and artificial, are real and pressing. These problems are chiefly the difficulty of establishing natural and artificial regeneration in adequate amount in due time, a puzzle which has plagued forest managers for 50 years. Reasons for failure are attributed to scant rainfall and a highly desiccative soil of coarse granite although high soil temperatures may also play a part.

There are estimated to be 250,000 acres in central Idaho that require artificial regeneration, of which 65,000 acres are in the Boise Basin. The Boise Payette Lumber Company has 17,000 acres of their own land from which brush should be eliminated and/or trees established.

Losses are also being sustained by existing reproduction. Domestic livestock are a serious problem in many areas and can be the difference between reproduction and none where the seedlings are less than 3 feet in height. Snags that are left in timber sales destroy young trees when they fall because their fall is by happenstance and not directed. There is need for early weedings in stands where other species (including brush) suppress or threaten to suppress ponderosa pine and by which the percentage of that species can be increased. Rabbits, mice, porcupines, and ground squirrels destroy limited numbers of planted trees.

Mice, chipmunks, squirrels, and birds consume ponderosa pine seed and in years of light seed crops can inflict appreciable losses.

Lodgepole Pine Type.--Industrial interest in this type has increased sharply in the last few years with the result that cutting has also been stepped up. This means that, as in Montana, information on management is at a premium. The Bridger, Targhee, Teton, Ashley, and Wasatch National Forests are those supporting the most lodgepole pine in the Intermountain Region. Judging from experience in Region 1 where demand for lodgepole and its management are a reality, the time when a similar situation will prevail in Region 4 is close at hand. Although a good start[6, 7, 8/] has been made the Intermountain Station has done very little research in Region 4 of this species in methods of cutting because the limited market was largely confined to poles and thus clear cutting, at least on a large scale, has been impossible. It is probable that cutting methods which have proved feasible and practical in Montana would apply in Region 4 but the problem of regulating initial and subsequent stand density must be solved if the species is to be grown successfully. A species that can be so easily regenerated and that grows so quickly in early life, obviously has interesting future possibilities for high consumption by industry.

6/ Tackle, David and D. I. Crossley. Lodgepole pine bibliography. Research Paper 30 (INT). 57 pp. 1953 [Processed].

7/ Tackle, David. Lodgepole pine management in the Intermountain region--a problem analysis. Misc. Pub 2, 53 pp., illus. 1954.

8/ Tackle, David. A Preliminary stand classification for lodgepole pine in the Intermountain region. Journal Forestry 53(8): 566-569, illus. 1955.

Spruce-alpine Fir Type.--The volume of this cut is also increasing in all parts of the region. In the areas visited little reproduction is in evidence because reproduction cuttings, as such, have not been made, and in others, probably because of grazing practice. There is usually sufficient seed available in this type so that if scarification is carried out on clear cut openings and an effort made to divert stock until seedlings are established on areas being reproduced, it would soon be discovered if this method is practical.

There does not appear to be the same problem, at least to the same degree, of invading vegetation in cutovers as in Montana. If this is true the securing of reproduction should be simplified providing other suitable measures are appreciated and applied. These measures are the clear cutting of mature stands so that widths of openings do not exceed 10 chains, the burning of slash, and scarification, preferably by mechanical means, and the exclusion of livestock until seedlings are sturdy enough to withstand trampling.

Mixed Softwoods Type.--This type is largely confined to the Payette National Forest and includes a mixture of ponderosa pine, Douglas-fir, lowland fir, western larch, and lodgepole pine. It is not extensive but supports relatively high volumes and is often found in east and north slopes associated with ponderosa pine on west and south slopes. The point is that very tolerant and very intolerant species found in

the same stand must be considered in relation to their silvical requirements and an appropriate cutting method employed to reproduce them.

Douglas-fir Type.--This type is widespread in the region and is found associated with several other species. In many parts of Idaho it is afflicted with mistletoe and the stems have ring-shake and brashness which makes milling difficult and produces a poor end product. The species is a prolific seed producer even when young and tends to establish itself on the cooler east and north exposures.

Much of the cutting in this type has been aimed at removal of mistletoed trees or overmature trees subject to insect attack and no research has been done in this type except where the species has occurred as an associate of ponderosa pine. Being a light demanding species, the system of group selection in which small clear cuttings are made and the ground scarified and slash dozer piled and burned should result in reproduction. It is likely that better timber can be grown under management than is found in the virgin stands because the rotation will be shorter, growth rates increased and an effort made to discriminate against the species on thin-soiled south and west sites.

Aspen Type.--The commercial aspen stands of the Intermountain Region are confined to central and southern Utah and are the only extensive stands of hardwoods in the region. Recent market

developments have resulted in increased use for this species as sawtimber. It has been a source of excelsior stock for some 40 years and continues to provide a major supply of this product. The species occurs in mixture with Engelmann spruce, alpine fir, white fir, ponderosa pine, and Douglas-fir but also in extensive pure stands.

It is striking to see the absence of reproduction due to stock and deer feeding in areas where aspen has been cut. Because all reproduction originates from root suckers its establishment is certain but its disappearance is equally certain unless stock is kept off cut-overs until the terminals are out of their reach.

CONCLUSIONS

General

One item affecting some forest types is worth noting. The most judicious use of K-V funds which should be employed, not only to establish stands of desirable species, but to follow up with appropriate silvicultural measures to maintain a desirable composition and growth, must be made carefully. This, in turn, means planning during sale appraisals and making provision for important silvicultural measures. If stand improvement is to be applied in types and stands for which all the K-V funds were employed to establish them, and for which the cutting cycle period is the same as the rotation (i.e. spruce), then either the K-V law will have to be interpreted broadly when the time arrives for cultural practices or a new law will have to be devised

and promulgated to fit the situation. If this is not done, many stands of species like Engelmann spruce and lodgepole pine will require a longer time to reach merchantable size or have undesirable composition because of no provision for suitable stand treatment.

Northern Rocky Mountain Region

Inland Empire

There are no problems in regeneration of the forest types of the Inland Empire which can be considered serious. The area enjoys sufficient rainfall in the critical growing period to insure acceptable establishment of seedlings in most cases. A few plantations are suffering from unknown sources of damage. It has been suggested that a survey of existing seedings and plantings be made to reveal weaknesses in past and present artificial regeneration procedures. Such a survey would involve a considerable amount of work and whether the findings would balance the effort is conjectural. Here, as in all parts of Region 1, a more strenuous effort and a more rigid policy in seed sources is a logical and sound step in the right direction in artificial regeneration. The next step, as suggested by experienced observers, is to develop site criteria for projected areas to be seeded or planted. These two considerations are basic and defensible.

Lowland white fir, (Abies grandis) is a species found commonly with Douglas-fir and heretofore regarded as a weed. It is a good example of a species on which great reliance will probably be placed soon as a source of wood fibre if the familiar pattern of increased

and more efficient utilization is recorded as it has been elsewhere. It would appear logical then to pursue vigorously the preliminary program, started in 1955, particularly the regeneration aspects of this species so that when the demand for management guides arise, research will be able to provide them.

Montana

One cannot help but be impressed anywhere research has been carried out in the Northern ~~Rocky Mountain~~ Region and particularly lately, by the methods employed in general layout using the vehicle of Station-NFA teamwork. It serves a four-pronged purpose:

1. It enables research to be done sooner than it otherwise would because of contributed manpower and equipment.

2. It enables more research to be done because it is not concentrated on an experimental forest but rather in the different types, wherever they happen to be.

3. It enlists disciples of research by virtue of their participation in the project and enables them to share in the progress towards better management.

4. It does not void the primary object of research which is to solve problems and publish the results.

Some major contributions have been made in this way, not only to research itself, but to the progress of research and confidence in it by those who might otherwise have regarded its merits only casually, if indeed, at all.

It is human to procrastinate and yet, for various ramifying reasons, research suffers indirectly though acutely from this common foible. Witness the recent interest in lodgepole pine as a future source of sustainable wood production, an interest reinforced by actualities in the form of permanent mills in eastern Montana with pressing requests for stumpage honored by substantial backing. Then reflect on the status of lodgepole pine research. Even though a commendable beginning has been made, the more difficult and time-taking facets remain unprobed and thus unanswered.

There are some urgent problems in the several types that need to be solved without delay.

Lodgepole Pine

1. What procedures are necessary to secure optimum initial stocking of this species per acre?
2. What is the most suitable method of reducing stocking in young high density stands, when should it be attempted, and how much will it cost?
3. What should be the stocking of this species in the early stages of stand development to insure optimum yield?

Larch--Douglas-fir Type

1. How many weedings are necessary to establish acceptable composition in larch--Douglas-fir stands? What will this require in man-hours?

2. How many improvement cuttings and thinnings will be necessary in the later stages of these stands to promote desirable stocking and result in optimum growth? What will this require in man-hours?

Spruce-fir Type

1. What are the results as far as natural seedling establishment are concerned when the spruce-fir type is broadcast burned or dozer piled and burned on the different cardinal aspects and slopes?
2. What produces mortality? High soil temperatures? Insufficient soil moisture?
3. How long do seedbeds remain receptive on the different aspects for broadcast burning and dozer piling and burning?
4. Is planting more effective than artificial seeding on areas that fail to regenerate naturally?
5. On areas where regeneration has been started, artificially or naturally, how many weedings are necessary and what will be required in man-hours to establish acceptable composition and stocking?

Ponderosa Pine Type

By far the most urgent problem in this type is the destruction of natural reproduction by deer on the Kootenai National Forest. An economic study is suggested here comparing the relative values of game and

wood crops followed by wide publicity for measures designed to reduce the deer population to a workable minimum.

Because some other areas are beginning to approach the Kootenai conditions, criteria developed as a guide in recognizing overbrowsing in its early stages, would be useful for land-managers in this type. It would enable them to take prompt action before severe deterioration of stocking sets in. Any reasonable measure that can be adopted to save ponderosa pine reproduction, directly or indirectly, is a sane and logical step.

There is also a need for developing planting criteria setting forth items such as soil, aspect, species, size of planting stock, and season of planting for all types, including ponderosa pine.

Intermountain Region

It is abundantly clear that there is room for improvement in the application of silvicultural procedures throughout the Intermountain Region. Heretofore the region has not been timber-minded and many of the basic silvical conceptions have been, for one reason or another, disregarded in the manipulation of forest cover. The reasons for this situation are well-known but now that it has changed for reasons set forth earlier in this statement, great opportunities are here for improvement in silvicultural standards.

One of the most glaring conflicts between poor and good forest management is the ubiquitous trespass of stock on areas which are

being regenerated or should be regenerating. While admittedly a difficult situation from the public relations standpoint, there are few if any instances where regeneration is premeditated and a conscious attempt made to direct stock and avoid decimation of seedlings. This is regrettable because when cutting budgets are being increased it is more than ever imperative to establish and achieve area quotas of reproduction establishment. Until this stage is reached, the forests are not being managed.

Another obvious shortcoming in sale areas are the standing snags after logging is completed. Apart from the fire risk standpoint, the undirected fall of these can and does cause heavy damage particularly in plantations. Snag falling at the time of timber felling is standard practice in other western regions. Why not in Region 4?

There is an urgent need for a planting and TSI manual which sets forth the principles of these important silvicultural measures. While they should be largely procedural in wording, sufficient explanation should be included in the text so that those who use it do not proceed by rote.

The subject of grass and reproduction was not raised in the field but it is nevertheless a very live question in Region 4. From research findings[9, 10/] and from just plain logic it can be safely accepted

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9/ Pearson, G. A. 1942. Herbaceous vegetation a factor in natural regeneration of ponderosa pine in the Southwest. Ecol. Monog. 12: 315-338, illus.

10/ Roy, D. F. 1953. Effects of ground cover and class of planting stock on survival of transplants in the eastside pine type of California. Calif. For. & Range Exp. Sta., Forest Research Note No. 87. 6 pp.

that seedlings and grass do not both thrive on the same square foot. The former will suffer and often die. This is true regardless of the age of one and the other or whether natural or artificial regeneration is involved. It resolves then into a question of policy on areas where trees are to be grown, which shall be favored. Research cannot provide this answer but until it is provided, regeneration will suffer.

Ponderosa Pine Type.--The establishment of ponderosa pine natural and artificial regeneration stands out as the top priority problem of the Intermountain Region. While a modest and promising start has been made (Town Creek) in solving this annoying problem, it is by no means settled. Pine managers are therefore under a distinct handicap. There is called for some bold and radical departures from conventional methods. Soil surface temperatures should be determined for some typical south and west exposures. Scarification trials should be made on several ranger districts and examined periodically for seedling establishment and survival,and receptiveness after varying lengths of time. Contour trenching on south and west exposures to reduce the microclimatic severity should be established on the Boise Basin Experimental Forest and the headquarters site so that they may be tested for natural and artificial regeneration.

Treatment of established reproduction needs exploring. The use of herbicides as well as powered cutters should be employed to weed

and to thin. Crew organization in these operations to reduce costs should be included in the trials.

Lodgepole Pine.--Cooperation with Administration on the Targhee and Bridger National Forest, and possibly elsewhere in plans for cutting and follow-up examinations should result in a better understanding in the management of this type.

Spruce-fir.--The same plan suggested for lodgepole pine applies to this type also except that it will be more experimental in nature and therefore more time consuming. Furthermore, conditions vary more widely in the spruce type in relation to marketability of products, grazing, operating period, and forest floor and therefore slightly different silvicultural procedures will be advisable. Active participation by Research in the planning stages are desirable if maximum benefits from existing knowledge are to be derived.

Douglas-fir.--Ordinarily no difficulty is experienced in the regeneration of this species although exceptions have occurred. Cooperation of Research and Administration should be arranged to learn the reasons for poor results in regeneration and to agree on measures to correct them in the cutting plans and follow-up treatment.

Mixed Type.--This type, transitional in make-up, is largely confined to the Payette National Forest and is important because of the volume supported and the species (Douglas-fir, lowland white fir, western larch, ponderosa pine) that it contains. Careful planning should be done in preparing marking guides if suitable composition is to be maintained in the new stands.

Aspen Type.--There is required for this type a high-level policy decision as to whether an effort is to be made to maintain it, at least on selected sites. It is one of the easiest types in the region to reproduce but deer, cattle, and sheep can prevent its establishment. In certain areas deer are responsible for its absence; in others, livestock. There have been no efforts made to protect aspen from browsing. Its protection cannot be justified where an understory of softwood provides full stocking as in Hamilton Flat on the Fishlake, in fact, removal through K-V funds of decadent overstory appears desirable, but in areas like the Salina drainage where no understory exists and where stumpage is sold, it appears unwise that no plan of management, particularly in relation to regeneration, is available for use in these stands.

Recommendations

The status of regeneration and its early treatment after establishment has been examined, observations made, and conclusions set down. An appraisal of the role which Research is playing has been attempted and suggestions for the immediate future have been made. No specific new work programs are outlined because they will necessarily have to be meshed with existing ones and priorities will have to be carefully considered before new work schedules are fixed owing to the limited effort available. To partly circumvent this situation it is urged that cooperation with NFA, particularly in

the planning stage, be encouraged, pursued, or continued, as the case may be. It should prove mutually beneficial and fruitful. The extent of increased research effort and the forms it should take are decisions to be made by the Division Chief after consultation with Center Leaders.